

Parasites of Toads from Singapore, with a Description of *Balantidium singaporensis* sp. n. (Ciliophora: Balantidiidae)

MUHAMMAD M. KHAN and YUEN K. IP

Parasitology Laboratory, Department of Zoology, National University of Singapore, Kent Ridge, 0511, Singapore

ABSTRACT—A report on the parasitic fauna of the toad *Bufo melanostictus* of Singapore was presented. Six protozoans, one trematode, one cestode, five nematodes and one acanthocephalan were recorded. Previous studies documented only helminths from the same host of this region. The specimens belonging to the genus *Balantidium* were different from other balantids described previously. These specimens, therefore, were named as *Balantidium singaporensis*. *Bufo melanostictus* was a new host for *Nyctotherus macropharyngeus*, and Singapore was a new locality record for five protozoans and one acanthocephalan.

INTRODUCTION

Bufo melanostictus Schneider, 1799 is a toad commonly found in Singapore. The parasitic fauna of toads has received little attention from local research workers. Sandosham [1] and Yuen [2, 3] reported only helminths from *Bufo melanostictus* of this region. Apart from these reports there is no other information available. This paper reports parasites found in *Bufo melanostictus*, with the description of a new species of the genus *Balantidium*.

MATERIALS AND METHODS

A total of 50 toads were examined for parasites. The gastro-intestinal tract, buccal cavity, blood and other tissues (lungs, liver, urinary bladder and gall bladder) were examined thoroughly. The methods of Cable [4] were adopted for the collection, fixation and staining of the parasites. In order to understand infraciliature, the specimens were fixed and stained by the method of Corliss [5]. Drawings were made with the aid of camera lucida.

RESULTS

The parasites, obtained from the different tissues of the hosts examined, are listed in Table 1. Of these, 13 were known species belonging to various genera, whereas one was a new species belonging to the genus *Balantidium* Claparede and Lachmann, 1858.

Balantidium singaporensis sp. n. (Figs. 1 and 2)

Of 50 toads, six were found to be infected with *Balantidium singaporensis*. They were found inhabiting the rectum of the host.

Diagnosis: Body ovoid, 54.60–98.80 (76.51) × 39.00–70.20 (50.93) μm ; a length to width ratio 1.5:1, maximum width at the middle of the body; no contractile vacuole; vestibulum extended upto one third of the body length from the anterior end.

Description: *Balantidium singaporensis* was ovoid with narrower anterior end. The posterior end was broadly rounded. The body was covered with longitudinal rows of cilia. This ciliate was found to possess 34 kineties. These kineties appeared as dark beaded longitudinal lines (Fig. 2). Kinetosomes that formed dark beaded longitudinal row were spherical. The distance between two kinetosomes of each row was 0.26 μm . Vestibulum, instead of running as a single groove, was

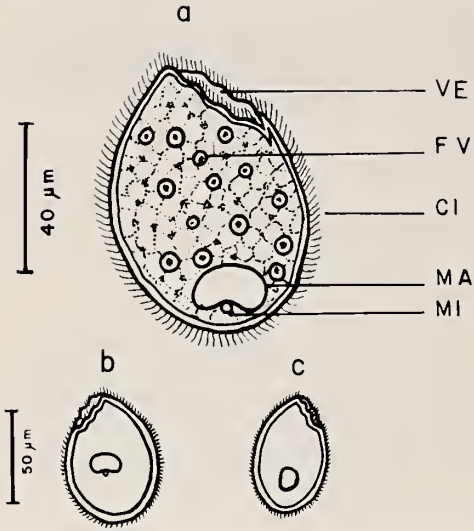


FIG. 1. *Balantidium singaporensis* sp. n. Lateral view of the specimens fixed in Schaudinn's fluid and stained with Heidenhain's haematoxyline. a: Entire specimen, b-c: Shape and position of macronucleus. CI: Cilia, FV: Food vacuole, VE: Vestibulum, MA: Macronucleus, MI: Micronucleus.



FIG. 2. Somatic ciliature and macronucleus of *Balantidium singaporensis* sp. n. seen in organism fixed in Champy fluid and DaFano fluid, and stained with 3% Silver Nitrate solution. Scale bar, 30 μ m.

found to possess slight folds on the right and left lips of vestibulum (Fig. 1a, b, and c). Vestibulum extended upto one third of the body length from the anterior end but never reached to the middle of the body. The nucleus position was variable. The characteristic position of the macronucleus was in the posterior third of the body (Fig. 1a), but occasionally can be observed in the middle (Fig. 1b) as well as in the anterior half (Fig. 2). The macronucleus was kidney shaped, sometimes subspherical (Fig. 1c). The spherical micronucleus was located in the concavity of the kidney shaped macronucleus. Food vacuoles were present in the endoplasm. Contractile vacuule was absent. The ratio of length to width was 1.5:1 with maximum width recorded at the middle of the body.

The measurements were made from 25 stained specimens and recorded as minima and maxima with average in parenthesis. The specimens were measured in micrometer. Length of body: 54.60–98.80 (76.51), width of body: 39.00–70.20 (50.93), average size: 76.51 \times 50.93, macronucleus: 13.00–20.80 (17.60) in length, 7.80–15.60 (11.70) in width, 17.60 \times 11.70 in average size, micronucleus: 1.90–2.90 (2.60) in diameter.

Type host: *Bufo melanostictus*.

Locality: Singapore.

Habitat: Rectum.

Type specimen: Deposited in the Parasitology Laboratory, Department of Zoology, National University of Singapore, Singapore.

Remarks: Bhatia [6] listed *Balantidium bicavata* Bhatia and Gulati, 1927 as symbionts in the rectum of *Bufo melanostictus*. The new species *Balantidium singaporensis* resembled *Balantidium bicavata* in the presence of folds in the vestibulum and in the absence of contractile vacuole. They also shared the same host species. However, it differed markedly from *Balantidium bicavata* in the size and shape of the body, the shapes of macro- and micro-nuclei and the extension of vestibulum. The folds observed in the vestibulum of the new species were not as deep as found in *Balantidium bicavata* [6]. The new species resembled *Balantidium amygdalli* Bhatia and Gulati, 1927 in the shape of body, but can be differentiated from the same by the larger body size, absence of contractile vacuole and the form of

vestibulum, including the shape of lips and depth of vestibulum. The new species was also similar to *Balantidium coli* var. *bovis* Cooper and Gulati, 1926, described from the intestine of cattle, in the general body outline with greatest width in the middle of the body. However, it can be distinguished from the same by the smaller body size, absence of contractile vacuole, absence of ribbon-shaped macronucleus [6], and the form of vestibulum. The present species can also be distinguished from other balantids, *Balantidium duodeni* Stein, 1867, *Balantidium elongatum* Stein, 1867, *Balantidium giganteum* Bezenberger, 1904, *Balantidium gracile* Bezenberger, 1904, *Balantidium helenae* Bezenberger, 1904 and *Balantidium sushilii* Ray, 1932, described from the gut of frogs, by the body size, absence of contractile vacuole and the form of vestibulum.

DISCUSSION

The present investigation represents a report on

the parasitic fauna of *Bufo melanostictus* in Singapore. The data presented in Table 1 show an overall picture of the parasites recorded from different tissues and organs of the hosts examined. Although helminth parasites have earlier been reported by Sandosham [1] and Yuen [2, 3] from the same host, the information collected by the present authors on Protozoa and Acanthocephala is new to this region. The list of helminths reported here is very similar to that of Yuen [2, 3] except for the nematode, *Africana singaporensis*, which was first described as a new species by Sandosham [1] from the same host in Singapore.

Singapore was a new locality record for a number of parasites (Table 1). *Bufo melanostictus* was also a new host record for *Nyctotherus macropharyngeus*. The specimens belonging to the genus *Balantidium* were clearly distinguished from the allied species described from the same or different hosts. They were, therefore, designated as a new species. Since it was reported from Singapore, the name *Balantidium singaporensis*

TABLE 1. List of parasites recorded from *B. melanostictus* in Singapore

Parasites recorded	Habitat	Remarks
Protozoa		
1. <i>Haemogregarina nucleobisecans</i>	Blood	New locality record
2. <i>Opalina ranarum</i>	Rectum	New locality record
3. <i>Opalina triangularis</i>	Rectum	New locality record
4. <i>Nyctotherus cordiformis</i>	Rectum	New locality record
5. <i>Nyctotherus macropharyngeus</i>	Rectum	New locality and new host record
6. <i>Balantidium singaporensis</i>	Rectum	New species
Trematoda		
<i>Mesocoelium sociale</i>	Intestine	————
Cestoda		
<i>Nematotaenia dollfusi</i>	Intestine	————
Nematoda		
1. <i>Rhabdias brachylaimus</i>	Lungs	————
2. <i>Oswaldcruzia hoepplii</i>	Intestine	————
3. <i>Oxysomatium macintoshii</i>	Rectum	————
4. <i>Amplicaecum communis</i>	Intestine	————
5. <i>Africana singaporensis</i>	Rectum	————
Acanthocephala		
<i>Pseudoacanthocephalus bufonis</i>	Intestine	New locality record

was proposed.

Pseudoacanthocephalus bufonis was also recorded for the first time from Singapore. This species has a wide range of distribution and occurs in many amphibian hosts. Van Cleave [7], Yamaguti [8, 9], and Yamaguti and Mitunaga [10] also reported this species from frogs (*Rana nigromaculata*, *Rana tigrina*) and toads (*Bufo asper*, *Bufo melanostictus*, *Bufo penangensis*, *Bufo viridis*) of China, Indochina, Formosa, Russia and Japan. The acanthocephalans were found firmly attached to the intestinal wall by the proboscis. The maximum worm burden per host was about 50. Sometimes the intestine was found completely blocked during heavy infestation by these parasites.

REFERENCES

- 1 Sandosham, A. A. (1953) Malaysian parasites, XV: Seven new worms from miscellaneous hosts. *Inst. Med. Res. Malaya*, **26**: 216-226.
- 2 Yuen, P. H. (1962) Some studies, mainly taxonomic on helminths of Amphibia. B. Sc. (Hons) Thesis. Department of Zoology, University of Singapore.
- 3 Yuen, P. H. (1963) Two new species of the genus *Amplicaecum* Baylis from Malayan amphibians. *Parasitology*, **53**: 89-94.
- 4 Cable, Raymond M. (1957) *An Illustrated Laboratory Manual of Parasitology*, 4th Print, Burgess Publishing Co., Minnesota.
- 5 Corliss, J. O. (1953) Silver impregnation of ciliated protozoa by the Chatton-Lwoff technic. *Stain Technol.*, **28**: 97-100.
- 6 Bhatia, B. L. (1936) Protozoa: Ciliophora. In "The Fauna of British India, Including Ceylon and Burma". Ed. by R. B. S. Sewell, Taylor & Francis Ltd., London, pp. 218-230.
- 7 Van Cleave, H. J. (1937) Acanthocephala from China. II. Two new species of the genus *Acanthocephalus* from Amphibia. *Parasitology*, **22**: 395-398.
- 8 Yamaguti, S. (1954) Helminth fauna of Mt. Ontake. Part I. Nematoda and Acanthocephala. *Acta Med. Okayama*, **8**: 386-392.
- 9 Yamaguti, S. (1954) Parasitic worms mainly from Celebes. Part 8. Acanthocephala. *Acta Med. Okayama*, **8**: 406-413.
- 10 Yamaguti, S. and Mitunaga, Y. (1943) Intestinal helminths from *Bufo melanostictus* of Formosa. *Trans. Nat. Hist. Soc. Taiwan*, **33** (241): 300-311.